II. Remarks

Claim 10 has been cancelled and claim 9 amended without introduction of new matter. Claim 9 was rejected under 35 U.S.C. § 112 because "the jib and hook" lacked antecedent basis. This is corrected by the above amendment and, as such, Applicant respectfully requests that this rejection be withdrawn.

Claim 9 was also rejected under 35 U.S.C. § 103 as being obvious over a combination of three references. The Examiner began his analysis by characterizing the teaching of the Seppaelae reference, however, Applicant believes that the characterization was incorrect for the following reasons:

1. Seppaelae discloses a carriage transportation means that comprises a hydraulic cylinder 4 and a block mechanism mounted to the hydraulic cylinder with wires (5,5',6,6') that work together to transport the carriage over twice the distance compared to the length of the stroke of the cylinder. (see col. 4, lines 9-15 and lines 32-36 of Seppaelae). In other words, the cylinder of Seppaelae cannot travel the full length of the vehicle frame.

In contrast, Applicant's invention requires a "multi-stage" cylinder in order to move the carriage the entire length of the elongated body. Because the "moving end" of Applicant's cylinder is attached "directly" to the carriage a "multi-stage" cylinder is needed in order to obtain the required extension that allows the carriage to move from the "rear end" of the elongated body to the "front end." The Seppaelae does not have the extension of a "multi-stage" cylinder, so it is therefore necessary to employ the complicated combination of wires and multiple pulleys to move sled 2.

2. The cylinder 4 of Seppaelae is not connected "directly" to the sled 2 as required by Applicant's claim. The cylinder in Seppaelae is ***indirectly*** connected to the sled by a complicated system of pulleys and wires. This is

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necessary because Seppaelae only discloses the complicated "carriage transportation means" discussed above, which cannot traverse the entire length of the frame. Because Applicant claims a "multi-stage" cylinder that provides the necessary extension length, it can extend telescopically the entire length of the elongated body, thus allowing the "moving end" of the cylinder to be connected "directly" to the carriage.

3. Seppaelae does not disclose that a "fixed end" of a "cable is attached directly to the rear end of the elongated body." In contrast, the fixed end of the wire in Seppaelae is attached to the hook arm 3, which move in a pivoting motion. (see col. 3, lines 29-31 and Fig. 6 of Seppaelae). Likewise, Seppaelae does not disclose "that as the carriage moves towards the front end of the elongated body the cable is pulled around the cable sheave," in turn pulling "a connected container or other structure in the same direction as the carriage." This can only occur if the "fixed end" of the cable is attached to the non-moving elongated body. In fact, Seppaelae requires that two separate mechanical parts move independently of each other so that the wire can pull a container onto the frame. Hook arm 3 must rotate forward while sled 2 moves towards the front of the frame. In contrast, in Applicant's invention only the carriage moves to load a container using the cable sheave and cable combination.

4. Seppaelae only teaches the use of wires and pulleys to move the sled. Applicant's invention now specifically disclaims the use of "cables, wires, chains, or pulleys" as mechanisms that move the carriage. Moreover, the carriage in Applicant's invention is moved only by a ***direct*** connection of a "multi-stage" cylinder to the carriage without the need for any other mechanical linkage or mechanisms. Such a system is clearly not disclosed in Seppaelae or the other two cited references.

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5. Seppaelae does not disclose "a first pair of hydraulic cylinders" to raise and lower the jib and hook. Seppaelae only discloses the use of one cylinder.

Because the Seppaelae reference does not teach Applicant's invention, the Examiner was required to search for other reference (Raisio and Rossi) in an attempt to combine the teachings. However, Applicant contends that even if the combination of all three references were proper, a *prima facie* showing of obviousness has not been established. Additionally, the Examiner has not set forth any evidence that a person skilled in the art would be motivated to combine the teachings of these three references.

Turning next to Raisio, it appears this reference was cited because it teaches the use of a pair of cylinders that operate a hook. However, Applicant contends that there is no motivation to combine the lift hook mechanism of Raisio with the teachings of Seppaelae because the hook design of Raisio requires that it be 1) stationary and pivotally connected to the frame and 2) positioned in the center of the frame so the hook can reach over the rear of the hoist frame. Raisio also fails to teach the missing claim elements described above.

Likewise, combining Rossi with Seppaelae and Raisio does not supply the missing claim elements of Applicant's invention and, as such, a *prima facie* case of obviousness cannot be maintained. As cited, Rossi EP 564403 is a non-English publication. Enclosed for the Examiner's convenience is the Canadian equivalent (CA 2,131,356) printed in English, which Applicant believes supports the position that Rossi does not supply the claim elements missing in Seppaelae and Raisio. Indeed, contrary to the Examiner's contentions, Rossi does not disclose a "cable sheave and cable combination" as claimed in Applicant's invention. In fact, there are no cables or cable sheaves disclosed in Rossi. Rossi actually teaches away from using cables stating

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that the use of a cable "represents a potential danger." (see pg. 3, 1st para. of CA '356). As such, Rossi only teaches the use of a "traction chain 5" to drive carriage 8. In contradistinction, Applicant has now disclaimed the use of "cables, wires, chains, or pulleys" to drive the carriage of Applicant's invention.

Rossi also does not disclose a "multi-stage cylinder," or for that matter any type of cylinder, that is connected "directly to a carriage" to drive the carriage the length of the frame. The carriage of Rossi is driven solely by chain 5 that is driven by motor 42. Not only does Rossi not teach the use of cables, but it also does not teach having a "fixed end" of the cable attached to the non-moving frame. Instead, Rossi uses second "pick-up chain 6" connected to the chain 5 in such a manner that when chain 5 rotates like bicycle chain, so does chain 6. Thus, there is no "fixed end" of chain 6 because it necessarily must move with chain 5. (see pg. 8, 1st para. of CA '356). There also is no "cable sheave" connected to the carriage 8. In fact, chain 6 can move independently of the carriage because 1) it is not connected to the carriage and 2) the carriage can be disengaged (unpinned) from chain 5. (see pg. 10, paras. 1, 2 & 3 of CA '356). In contrast, Applicant's second engaging mechanism (the cable sheave and cable combination) can only operate if the carriage is moved towards the front of the elongated body, which causes the cable to be pulled around the cable sheave, thus pulling a connected container or other structure in the same direction as the carriage. Clearly, none of the cited references alone or in combination disclose this mechanism. Accordingly, Applicant respectively requests the obviousness rejection be withdrawn.

Applicant submits the presently amended claim 9 defines a patentable system for loading and unloading a container or other structure from a transport vehicle and believes this case is now in condition for allowance. If for any reason the application is not in condition for

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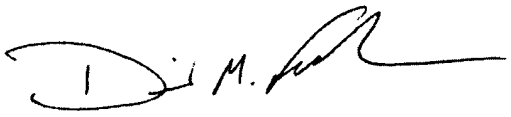
allowance and a telephonic conference would be helpful, please do not hesitate to contact the undersigned directly at 312/913-2143.

Respectfully submitted,

Date: 2/28/07

By: 

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(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Device for Loading and Unloading of a Load-Carrying Unit on a Vehicle

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(71) Tuchschmid AG - Switzerland ;

(57) 14 Claims

Abstract

The device has a tilting-frame (4), in the plane of which a traction chain (5) is arranged. In a known way, the traction chain is connected with a pick-up chain (6) = on the end of which a claw (7) is arranged. A carriage (8) is arranged to be able to slide parallel to the traction chain (5), the carriage feed being achieved by means of the traction chain (5). A pivotable grabbing-arm, possessing a hook (10), is mounted to articulate on the carriage, the hook likewise being able to be connected to a load-carrying unit. The device permits alternative pick-up of a load-carrying unit either with the hook (10) or with the claw (7). In this way, the advantages of both loading systems can be realised in a single device.

(Figure 1)

TUCHSCHMID AG

Device for Loading and Unloading of a Load-carrying Unit on a Vehicle

The invention concerns a device for loading and unloading of a load-carrying unit on a vehicle according to the preamble to claim 1.

The transfer of standardised load-carrying units such as containers, bulk goods silos and similar = especially in connection with combined road and rail transport = with the aid of a so-called change-over device directly from the rail wagon to a powered vehicle, or lifting from the ground and placement again onto the ground, has been known for some years. These change-over devices are mounted on the chassis of motor trucks and permit handling of heavy loads by a lone individual, namely: the truck driver. Although load-carrying units have been internationally standardised (DIN 1025/1026), two types of change-over device have developed in practice, namely: the chain device and the hook device.

A typical chain device has, for example, been made known through EP-A-221 600. The chain device has a hydraulically pivoting tilting-frame attached by a linkage to the rear end of the chassis. A continuous traction chain is mounted in the plane of the tilting-frame and can be driven in both directions. A pick-up chain is affixed to the traction chain, on the end of which a claw is mounted. This claw can engage in coupling-pins arranged near to the ground on the facing side of the load-carrying unit. The pick-up chain serves to raise the load-carrying unit up to the height of the tilting-frame, after which the load-carrying unit is pulled onto the tilting-frame. During pick-up of the load-carrying unit from the ground, the tilting-frame is placed in an inclined position. During transfer of a load-carrying unit from a rail

wagon or from another truck, the tilting-frame will remain in the horizontal position.

With hook devices, a type of tilting-frame is likewise mounted on the chassis. To pick up the load-carrying unit, however, no chain is required, but a hydraulically pivotable grabbing-arm which is provided with a hook. This hook can grasp a shackle in the upper area of the facing side of the load-carrying unit, and in this way lift the load-carrying unit and pull it onto the tilting-frame. With hook devices, too, a transfer from rail wagon to truck is, of course, possible. A typical hook device is, for example, described in EP-A-192 689.

A disadvantage of the change-over devices known up to now is that each device possess advantages and disadvantages. The appropriateness of either a chain device or a hook device will depend on the nature of the load-carrying unit and the load it contains, and also on the prevailing on-site circumstances. A haulage company will not, however, procure both types of change-over device, but decide on either one type or another, particularly because the load-carrying units are so designed that they can be handled by both types. This situation is, however, extremely unsatisfactory, since optimal conditions for a certain type are never encountered. Thus, according to the prevailing conditions when loading a load-carrying unit, the hook device can be more appropriate, while during unloading of the same load it may well be better to use the chain device.

Indeed, a device for loading and unloading a load-carrying unit has already been made known in WO 85/00787 with which differing grabbing means are provided on a chassis. Two grabbing means are arranged on a carriage which can be displaced along the chassis, said grabbing means being independent from one another and deployable at different

positions on the load. The carriage can only be moved by means of a traction cable or a winch, with the load also being able to be attached directly to the traction cable when the carriage position is locked. According to the deployment of the preferred grabbing system, and according to whether the load is to be picked up onto the chassis or is to be pushed clear of the chassis, relatively complicated and time-consuming resetting of the traction cable is required with this device. In contrast with continuous traction chains, the traction cable represents a potential danger, so that these kinds of device have not become established in practice.

It is thus a purpose of the invention to create a device of the type mentioned in the introduction which combines the operating advantages of both types of change-over devices and which permits the operator a free choice with regard to the use of the claw or the hook to pick up the load-carrying unit, in accordance with on-site conditions. According to the invention, this purpose is fulfilled with a device possessing the features in claim 1.

The carriage with the pivotable grabbing-arm, which is able to be driven in both directions of movement by means of the traction chain, not only permits selective deployment of the hook, but also enables the grabbing-arm mounted on the carriage to travel to an optimum position. With known hook devices, the grabbing-arm was as a rule firmly linked to the tilting-frame and was not displaceable. In order to engage the hook in the loading carrier at all, a complicated pivoting movement was therefore necessary. The carriage now enables the load-carrying unit to be simultaneously lifted by the grabbing-arm and pulled by the carriage. With chain operation, the carriage remains at the rest position together with the grabbing-arm, in no way hindering the loading or unloading procedure.

In order to slide the carriage, this possesses a releasable coupling for direct or indirect connection with the traction chain. This coupling could, for example, be engaged manually. Preferably, however, the coupling possesses hydraulically or pneumatically activated locking-pins which can be inserted into the links of the traction chain and/or into the claw. For pulling the carriage, the force can also be directly transferred to the claw which engages in the carriage.

The load-carrying unit can be lifted from the ground in a particularly advantageous way if a pick-up chain is attached to the traction chain, and if the claw is arranged on the end of the pick-up chain. A sliding element on the traction chain and/or on the claw produces the interlocking connection between the traction chain and the claw. In this way, with the aid of the traction chain, a load can be pushed away from the chassis without problems by means of the claw. The claw could, however, also be connected with the traction chain by means of a rod or a shackle, or in certain cases it could even be directly connected to the traction chain.

It is of particular advantage if the carriage possesses two carriage limbs which are connected together by means of a yoke in such a way that the traction chain runs between the carriage limbs and the yoke spans the traction chain. Both the carriage limbs provide optimal lateral stability, with the traction chain being arranged exactly in the middle of the chassis. Particularly stable guidance will here result if the carriage limbs, on their facing inner sides, possess slider blocks which are guided in U-shaped guide-rails, the longitudinal axes of which run parallel to the plane of the tilting-frame. Through these means of construction, also high torque can be imparted by the carriage onto the tilting frame. Naturally, other means of guidance, such as rollers, are conceivable.

A particularly advantageous construction for the guidance of the carriage and for the guidance of the traction chain will result if the tilting-frame possesses a hollow box-shaped tilting-beam which forms the framework for the traction chain, and if at least one guide-rail is arranged on each of the two sides of the tilting-beam. Naturally, the carriage guide could also ensue on a plurality of guide-rails.

The carriage is preferably fitted with a mechanical stop for the load-carrying unit. It can be thus be ensured that, in the loaded position, the load-carrying unit is always located in a correct end position. At the same time, however, the carriage forms an adjustable mechanical stop for the load-carrying unit, said mechanical stop being exactly adjustable to the length of the load-carrying unit. A mechanical stop of this type was not known with conventional chain devices. In order to lock the carriage firmly, it can be locked to the tilting-frame with an insert pin.

When grasping the load-carrying unit with the hook, the claw is not required. The claw can therefore be so arranged to be able travel to a rest position behind the plane of the mechanical stop, so as not to create a hindrance. In the reverse case, for chain operations, the hook, respectively the whole grabbing-arm is not required. It is, with particular advantage, therefore brought into a rest position in which the hook is inclined away from the load-carrying unit, out of a vertical plane running parallel to the pivot axis of the arm. Since the shackle of the load-carrying unit lies at the same height as the hook when in the loading position, a collision with the shackle is reliably avoided by inclining the hook away = respectively the entire grabbing-arm.

The entire unit can be controlled in a particularly advantageous way if sensors are arranged on the carriage for

detecting the position of the claw and/or the grabbing-arm and/or the load-carrying unit. In this way, an optimal degree of operating safety is achieved since the operator can always immediately recognise any respective phase of operation.

Further individual features and advantages of the invention arise from the following description of an embodiment and from the drawings. Namely:

Figure 1 a perspective view of a device in accordance with the invention, mounted on a chassis,

Figure 2 a perspective view of a carriage without grabbing-arm,

Figure 3 a perspective view of an, in principle, known claw,

Figure 4 a section through the carriage according to figure 2, with details of the locking system,

Figure 5 one of the locking devices which are mounted on the carriage,

Figure 6 a cross section through the tilting-frame with upright grabbing-arm,

Figure 7 a side view of the grabbing-arm according to figure 6 in the hook loading position,

Figure 8 a side view according to figure 7 in the hook pick-up position,

Figure 9 a side view of the device in the claw pick-up position.

Figure 10 a device according to figure 9 during raising of the load-carrying unit,

Figure 11 the device according to figure 9 in the claw loading position,

Figure 12 a side view of the device in the hook pick-up position,

Figure 13 the device according to figure 12 during raising of the load-carrying unit,

Figure 14 the device according to figure 9 in the hook loading position, and

Figure 15 the side view of a vehicle with shortened load-carrying unit.

Figure 1 shows the chassis 3 of a vehicle which is here not shown in greater detail, onto which the tilting-frame 4 is mounted to articulate. Thus, the tilting-frame is able to pivot about the tilting-frame linkage 15 on the rear edge of the chassis, for which purpose hydraulic cylinders 43 at both sides of the chassis are put into operation. In principle, the tilting-frame comprises a hollow box-section beam 16 (Figure 6) on which lateral frame supports 36 are arranged at definite intervals. These lateral frame supports support the rollers 37 in the outer area, on which the support profile 38 of a load-carrying unit can be rolled. In order to obtain better torsional stability in the area where the force of both the hydraulic cylinders 43 is applied, both the rearmost lateral frame supports are connected together by longitudinal beams 47.

The tilting-beam 16 also serves as a framework for the continuous traction chain 5 which is tensioned between the

front chain deflecting wheel 41 and a rear chain deflecting wheel 40. With that, the upper span of the traction chain rests on the tilting-beam 16. The drive of the traction chain is by means of a hydraulic chain drive motor 42 which is flanged onto the front chain deflecting wheel. The pick-up chain 6 which is fastened to the traction chain 5 rests on the traction chain, with the claw = which is fastened to the end of the pick-up chain = not being visible in figure 1, since said claw lies within the carriage 8.

The carriage 8 is guided on both sides of the tilting-beam 16 and is driven via the traction chain 5. An L-shaped grabbing-arm 9 is linked to the carriage, on the end of which a hook 10 is arranged. The pivoting movement of the grabbing-arm is achieved by means of a hydraulic cylinder 34. Further details of the combined carriage/grabbing-arm can be seen in figures 2 to 8.

Further, in principle already known means of securing a load-carrying unit to a vehicle are arranged on the device. Side security-supports 39 can be folded in, in order to prevent the load-carrying unit from lifting away from the tilting-frame. Relief of rear wheel-loading when picking up the load can be achieved with a rear axle support 48.

On the basis of figures 2 to 5, first of all the individual components of the carriage will be explained. As figure 2 shows, the carriage 8 comprises in principle both parallel carriage limbs 11 and 11', which are connected together by a slightly raised yoke 12. At least two blocks 13 are fixed to each of the facing inner sides of the carriage limbs 11, 11'. The facing side of the yoke 12 takes the form of a semi-circular recessed mechanical stop 17 in the area where the yoke 12 merges with each carriage limb, the function of which is more closely explained in the following. A bearing 19 to support the piston/cylinder unit for pivoting the grabbing-arm

is arranged on the upper section of the yoke. The grabbing-arm itself rotates in bearing sleeves 18 in each of the carriage limbs. Arranged on each of the sides of the carriage is a coupling device 21 for direct or indirect interlocking connection of the carriage with the traction chain, together with a locking device 20 for locking of the carriage 8. Various sensors provide information about the operating condition of the device. A sensor 22 ascertains whether the load-carrying unit has reached its end position at the mechanical stop 17. The two sensors 23 ascertain the position of the grabbing-arm, and the sensor 24 ascertains the position of the claw.

The sensor 24 is mounted on a mechanical-stop pin 52 which, together with an axially opposing mechanical-stop pin, serves as a mechanical-stop for the claw. By this means, the locking-pins 58 must not bear the entire load during pulling of the carriage. With regard to position and diameter, both mechanical-stop pins correspond to the attachment pins 30, 30' (figure 3) of a load-carrying unit. The tensile force is thus transferred via the hook 28 of the claw 7 to the carriage 8 when the load-carrying unit is suspended on the grabbing-arm 9.

Figure 4 shows individual components of the locking and coupling devices which are possible on the carriage 8. The pick-up chain 6 is connected to the continuous traction chain 5 by means of a chain connector 50. For reasons of safety, the traction chain is of strengthened design along the entire potential distance between the front deflection wheel 41 and the chain connector 50. A sliding cam 51 fixed to the traction chain 5 ensures that the forces imparted onto the traction chain are transferred to the claw 7, also during reversed drive. In place of the sliding cam, another sliding element could be used, fastened to the traction chain 5 or onto the claw 7.

As is shown, coupling devices 21 for interlocking connection between the carriage 8 and the traction chain 5 are provided in both the carriage limbs 11 and 11'. These coupling devices engage laterally into the claw 7, although they could also engage into the links of the traction chain 5. In the same way, locking devices 20 for locking of the carriage onto the tilting-beam 16 are arranged on both carriage limbs. These locking devices are in practice the same design as the coupling devices 21. The insert-pins 53 of the locking device 21 can be inserted into bores 54 which are provided at regular intervals on the tilting-beam 16.

Figure 5 shows the construction of a locking device 20, respectively a coupling device 21. A piston 56 is guided in a pressure cylinder 55 on which the pins 53 or 58 are affixed. The piston 56 is under tension from a pressure spring 59 which always presses the pins 53/58 into the engagement position. This closed position is detected by means of the sensor 60 or a limit switch, and is transmitted to a control device. The piston can be acted upon via a pressure feed 57 so that it displaces against the pressure of the spring 56. With that, the pins 53/58 are brought to an open position. The piston 56 can be activated either hydraulically or pneumatically according to each individual case.

During chain operation, the coupling devices 21 are always released, while the carriage 8 is locked on the tilting-beam with the locking devices 20. On the other hand, during hook operation, the locking devices 20 are released while the coupling devices 21 are engaged, so that the carriage 8 can be moved by the traction chain along the tilting-beam 16.

Connection points for various supply pipes are provided on the facing side of the carriage limbs 11, 11'. The connection points 25, 26 and 27 can accept hydraulic hoses, pneumatic hoses and electrical cables. These services are laid in a

block-chain or energy-supply chain 49, as suggested in figure 1. Connection of the carriage to energy and control lines is thus independent of the relative position of the carriage and is therefore without problems. The position for the fixed attachment point of the energy-supply chain 49 is chosen in such a way that it lies approximately in the middle of the tilting-beam 16. In this way, the energy-supply chain will be completely extended in both carriage 8 end positions.

Figure 3 shows a claw 7 which is arranged at the end of the pick-up chain 6. The claw comprises the actual hook 28 and the centering web 29 which is arranged at the claw's centre. The claw can thus engage in the coupling-pins 30, 30' on the lower facing side of the load-carrying unit. The centering web, wedge-shaped at its upper edge, penetrates the intermediate space between the coupling-pins 30, 30'. In the loaded position, the coupling-pins 30, 30' come to rest at the mechanical stop 17. Contact at this position will ensue regardless of whether the load-carrying unit has been picked up with the claw or with the hook. The hook possesses lateral bores into which the locking-pins 58 can be inserted.

Further individual components of the carriage guide and the grabbing-arm can be seen in figures 6 and 7. With the tilting-beam 16, a cross-sectionally approximately square-shaped hollow box-section profile is used. The lateral frame supports 36 are welded to the underside of the tilting-beam. From these drawings, is can also be seen how the support profile 38 of a load-carrying unit comes to rest on the rollers 37. A U-shaped guide-rail 14 is welded to each side of the tilting-beam 16, in such a way that the profile axes run parallel to the plane of the tilting-frame. The sliding blocks 13 and 13' of the carriage will slide in these guide-rails 14 and 14', the carriage thus being guided both in the plane of the tilting-frame and in a vertical plane. Stabilising profiles can be welded to both sides, in order to strengthen the guide-rails.

The grabbing-arm 9 is formed approximately as a fork, and comprises the two approximately L-shaped grabbing-arm limbs 31 and 31' which are connected at their free end with a connecting piece 32. The hook 10 itself is arranged on this connecting piece. The articulated connection with the carriage 8 is achieved by means of bearing journals 45 which engage, from the outside, in the bearing bushes 18 as shown in figure 2. A hydraulic cylinder 34, with bearing journals 35 which engage in the bearing bushes 33, is arranged between both grabbing-arm limbs 3. The hydraulic cylinder 34 is also supported at the linkage bearing 19 on the carriage 8. As can be seen in figure 5, the hydraulic cylinder runs approximately parallel to the grabbing-arm when said grabbing-arm is in the vertical position.

Both possible positions of the claw 7 can be seen from figure 7. In the loading position, the carriage, both with hook and chain operations, is caused to travel to the front end-position adjacent to the chain deflection wheel 41. Figure 7 shows the hook loaded position, in which the hook 10 grasps the shackle 44 on the upper facing side of the load-carrying unit 1. In this position, the claw must not come into conflict with the lower area of the load-carrying unit on which the coupling pin 30 is arranged. The claw is therefore withdrawn to a rest position 7R, where it is located beneath the yoke 12 (figure 2), behind the plane of the mechanical stop 17. If, however, the load-carrying unit 1 is to be grasped on the coupling-pins 30 by the claw, the claw will be located in the loading position 7L. In this case, however, the grabbing-arm 9 must be tilted away, so that the claw 10 does not restrict the shackle 44.

Figure 8 shows the carriage 8 in the rear end-position, adjacent to the tilting-frame linkage 15. The grabbing-arm 9 has been pivoted out, so that the piston rod 46 is visible.

The hook 10 is now located approximately at the level of the chassis 3. Naturally, the hook 10 can be further lowered by pivoting the tilting-frame 4 upwards. The maximum possible pivoting position of the tilting-frame is suggested by a broken line.

Pick-up of a load-carrying unit 1 with the claw is explained with the aid of figures 6 to 11. The vehicle 2 is manoeuvred to a position where its chassis 3 is positioned near the facing side of the load-carrying unit 1. The tilting-frame 4 is slightly raised with the aid of the hydraulic cylinder 43, in order to facilitate connection of the load. Subsequently, the traction chain 5 is moved in the direction of the arrow a, until the pick-up chain 6 with the claw 7 hangs over the rear deflection wheel 40. With that, the carriage 8 with the grabbing-arm 9 remains in the rest position, since it is not required. The claw 7 is connected to the coupling-pins 30, and the device is then ready to pick up the load.

The traction chain 5 is now moved in the direction of the arrow b, the load-carrying unit 1 first of all being lifted with the pick-up chain 6 to the level of the tilting-frame 4. Pulling of the load-carrying unit onto the tilting frame (figure 10) then ensues, indeed sufficiently far that the coupling-pins 30 make contact with the mechanical stop 17 of the carriage 8. As can be seen particularly clearly from figure 11, the hook has been pivoted back into the rest position 10R, in which it is inclined at an angle α to the vertical. After or during pulling-up the load-carrying unit 1, the hydraulic cylinder 43 is once again relieved of pressure so that the tilting-frame 4 pivots back into its rest position. After securing the load-carrying unit by means of the already mentioned securing devices, the vehicle 2 is ready to drive away.

Figures 12 to 14 show the loading procedure during hook

operation. Once again, the vehicle 2 manoeuvres with its chassis to the facing side of the load-carrying unit 1, however not quite so near as with the chain operation. With the aid of the traction chain 5, the carriage 8 is moved into the rearmost position and the grabbing-arm 9 is pivoted out through activation of the hydraulic cylinder 34. At the same time, the tilting-frame 4 must also be pivoted up. The hook 10 is clipped onto the shackle 44, after which the device is ready to pick up the load.

The grabbing-arm 9 is pivoted back, with the load-carrying unit 1 carrying out an arched pivoting movement to be thus lifted onto the tilting frame 4 (figure 13). The carriage can now be moved into the front end-position d, with the load-carrying unit 1 on the hook 10 being pulled to its final transport position. The claw, which is not required in this case, is located at the already mentioned rest position 7R. During unloading of the load-carrying unit 1, both with hook operation and chain operation, in each case the reverse sequence is carried out. During transfer of a load-carrying unit onto a rail wagon or from a rail wagon, raising of the tilting-frame or lowering of the load-carrying unit with either the grabbing-arm 9 or the pick-up chain 6 is dispensed with.

Figure 15 shows a loaded position with a shortened load-carrying unit 1v. In order to be able to pick-up this load-carrying unit with the claw, the carriage 8 has been locked in the intermediate position zp. The carriage thus evidently forms a displaceable mechanical stop, which can be locked in various positions according to the length of the load-carrying unit. It would also be conceivable to be able to detach the grabbing-arm 9 so that the carriage 8 retains only the function of a displaceable mechanical stop for the load-carrying unit.

Inasmuch as the invention is subject to modifications and variations, the foregoing description and accompanying drawings should not be regarded as limiting the invention, which is defined by the following claims and various combinations thereof:

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. Device, mounted on a vehicle (2), for loading and unloading of a load-carrying unit (1), with a tilting-frame (4) which is mounted to articulate on a chassis (3), a continuous traction chain (5), for pulling on or pushing off the load-carrying unit, being stretched in the plane of said tilting-frame (4), and a claw (7), which can be connected to the load-carrying unit, being fixed to said traction chain (5), characterised in that a carriage (8) is mounted to be able to slide on the tilting-frame (4), said carriage being able to be driven in both directions of movement by means of the traction chain (5), and that a pivotable grabbing-arm (9), on the end of which a hook (10) is arranged which can be connected with a load-carrying unit, is mounted to articulate on said carriage, the load-carrying unit (1) being able to be grasped either with the hook (10) or with the claw (7).

2. Device according to claim 1, characterised in that the carriage (8) possesses a releasable coupling for direct or indirect connection with the traction chain (5).

3. Device according to claims 1 or 2, characterised in that a pick-up chain (6), on the end of which the claw (7) is arranged, is fixed to the traction chain (5) and that, when the claw is resting on the traction chain, an interlocking connection can be attained between the traction chain and the claw by means of a sliding element (51) on the traction chain and/or on the claw.

4. Device according to one of the claims 1 to 3,

characterised in that the carriage (8) possesses two carriage limbs (11, 11') which are connected together by means of a yoke (12) and that the traction chain (5) runs between the carriage limbs, with the yoke (12) spanning the traction chain.

5. Device according to claim 4, characterised in that the carriage limbs (11, 11') possess sliding blocks (13, 13') on their mutually facing inner sides, said blocks being guided within U-shaped guide-rails (14, 14'), the longitudinal axes of which run parallel to the plane of the tilting-frame.

6. Device according to claim 5, characterised in that the tilting-frame possesses a hollow box-section tilting-beam (16) which forms the framework for the traction chain (5), and that at least one guide-rail (14, 14') is arranged on each side of the tilting-beam.

7. Device according to one of the claims 1 to 6, characterised in that the coupling is attained by at least one pressure cylinder which possesses a locking pin which can be inserted into the links of the traction chain (5) and/or into the claw (7).

8. Device according to one of the claims 1 to 7, characterised in that the carriage (8) possesses or takes the form of a mechanical stop (17) for the load-carrying unit.

9. Device according to claim 8, characterised in that the claw (7) is able to be moved into a rest position behind the plane of the mechanical stop (17) during grasping of the load-carrying unit (1) with the hook (10).

10. Device according to one of the claims 1 to 9, characterised in that the carriage (8) is able to be locked to the tilting-frame (4) with at least one insert-pin which can be hydraulically or pneumatically activated.

11. Device according to one of the claims 1 to 10, characterised in that, during grasping of the load-carrying unit (1) by the claw (7), the grabbing-arm (9) is able to be moved into a rest position in which the hook (10) is inclined away from the load-carrying unit, out of a vertical plain which runs parallel to the pivoting axis of the grabbing-arm.

12. Device according to claim 4 and claim 11, characterised in that the approximately L-shaped grabbing-arm (9) is mounted to articulate on the carriage limbs (11, 11'), and that the grabbing-arm is able to be driven by a pressure cylinder (34) which is supported by the yoke (12).

13. Device according to one of the claims 1 to 12, characterised in that sensors (22, 23, 24) for detecting the position of the claw (7) and/or the grabbing-arm (9) and/or then load-carrying unit (1) are arranged on the carriage (8).

14. Device according to claim 4, characterised in that the carriage (8) is connected to control lines which are guided within at least one moveable link chain which runs parallel to the traction chain (5) and is coupled to the facing side of at least one carriage limb (11).

Fig. 1

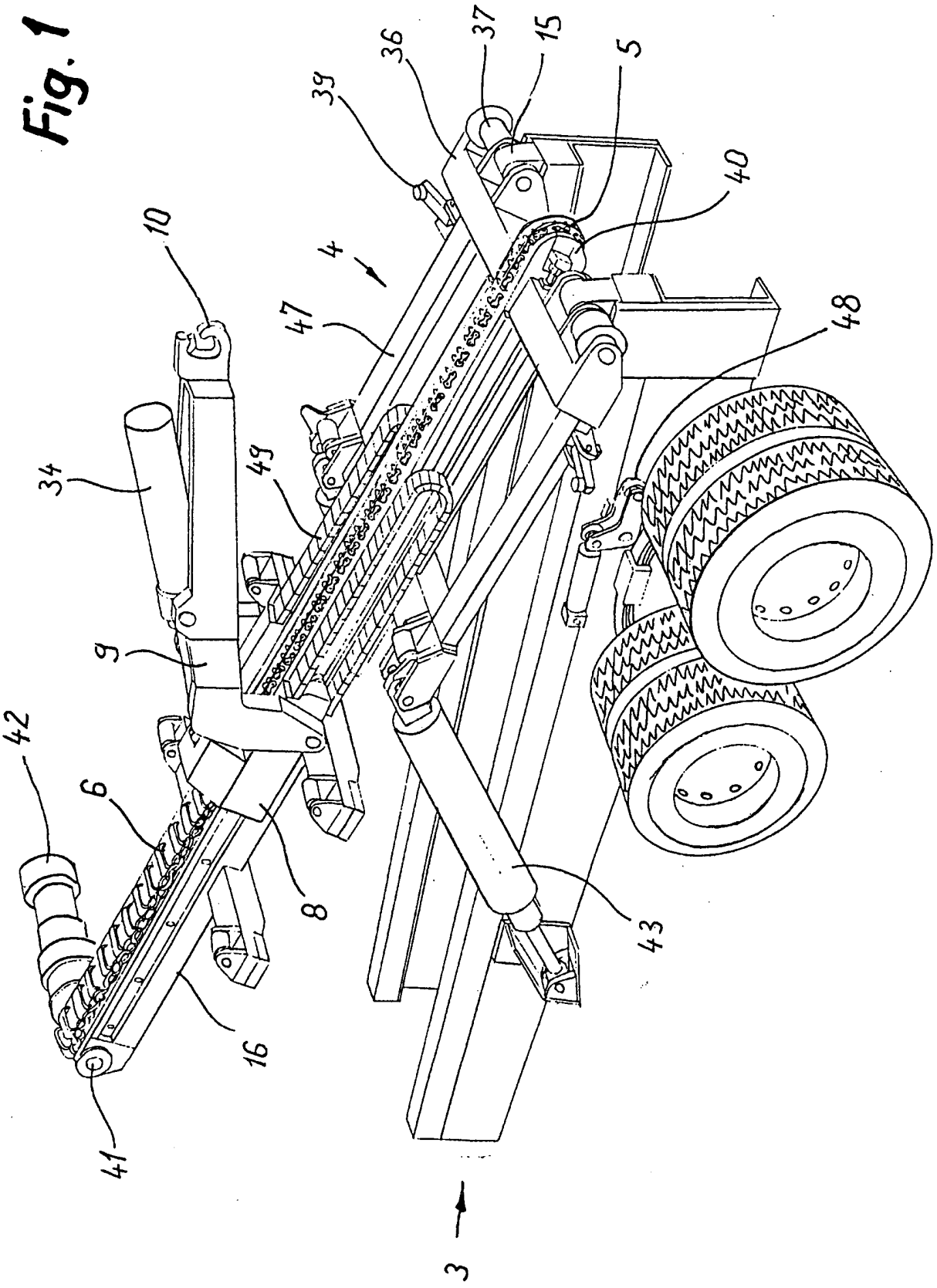


Fig. 2

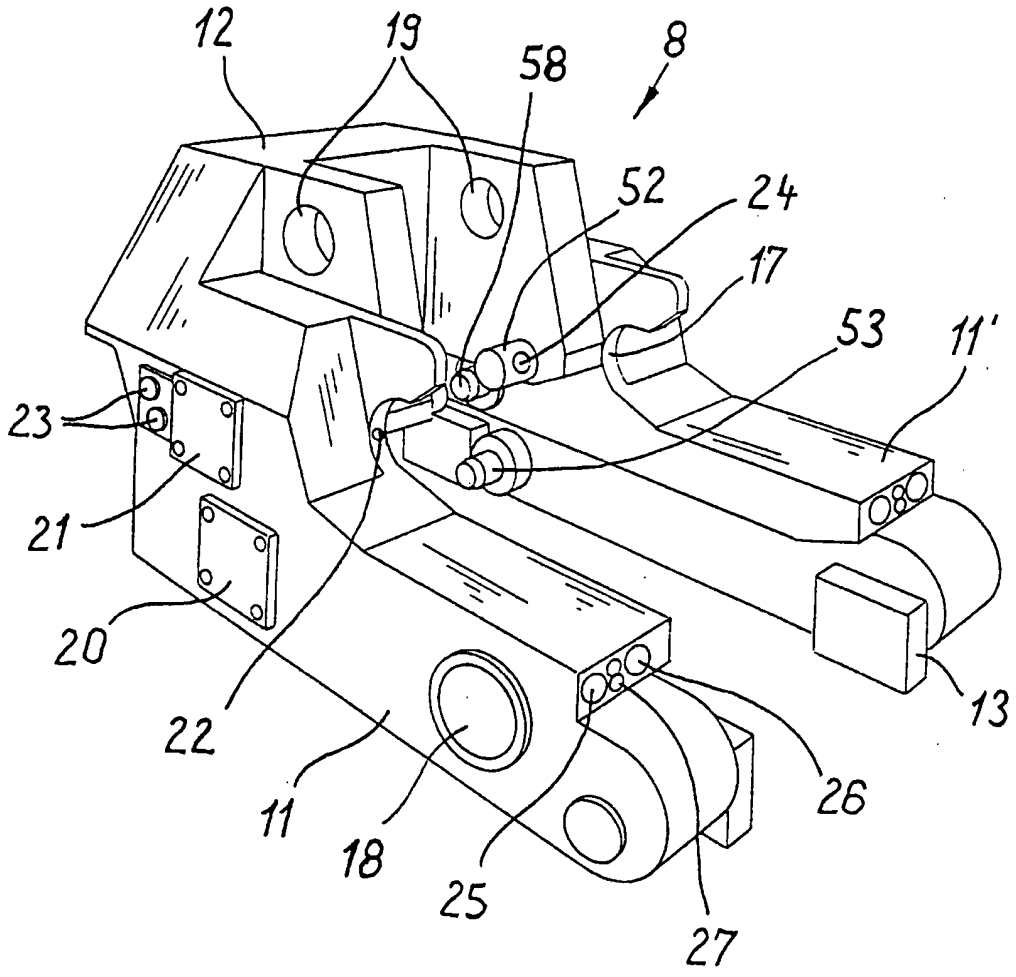


Fig. 3

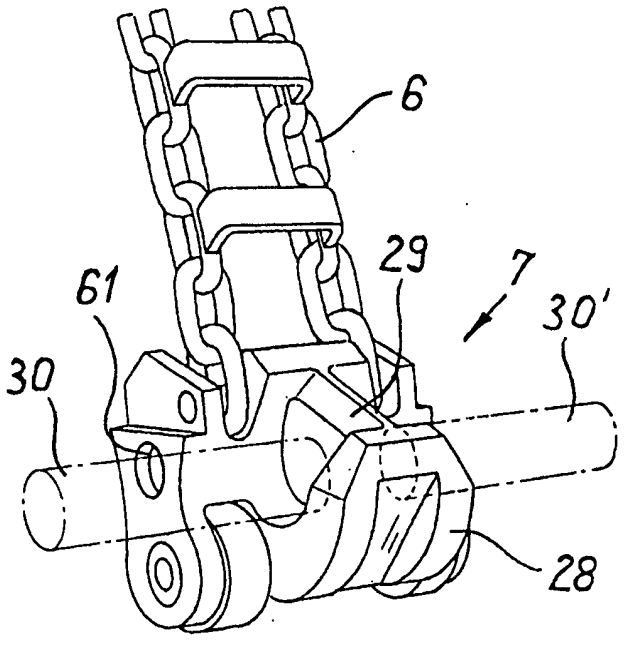


Fig. 4

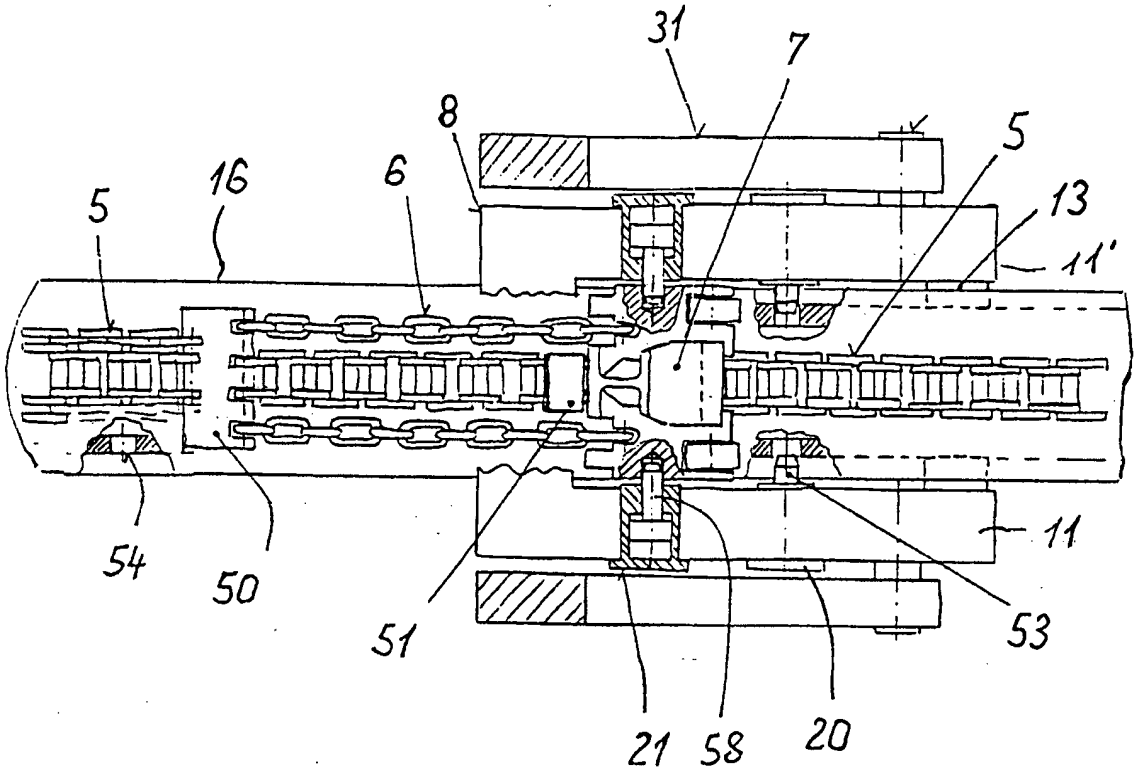


Fig. 5

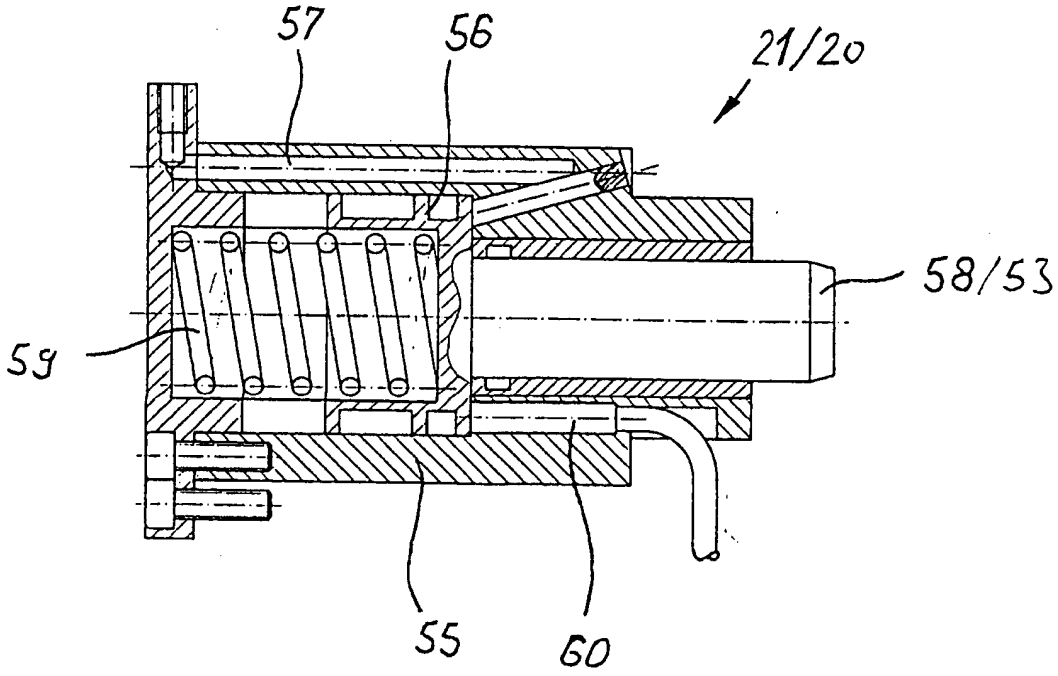


Fig. 6

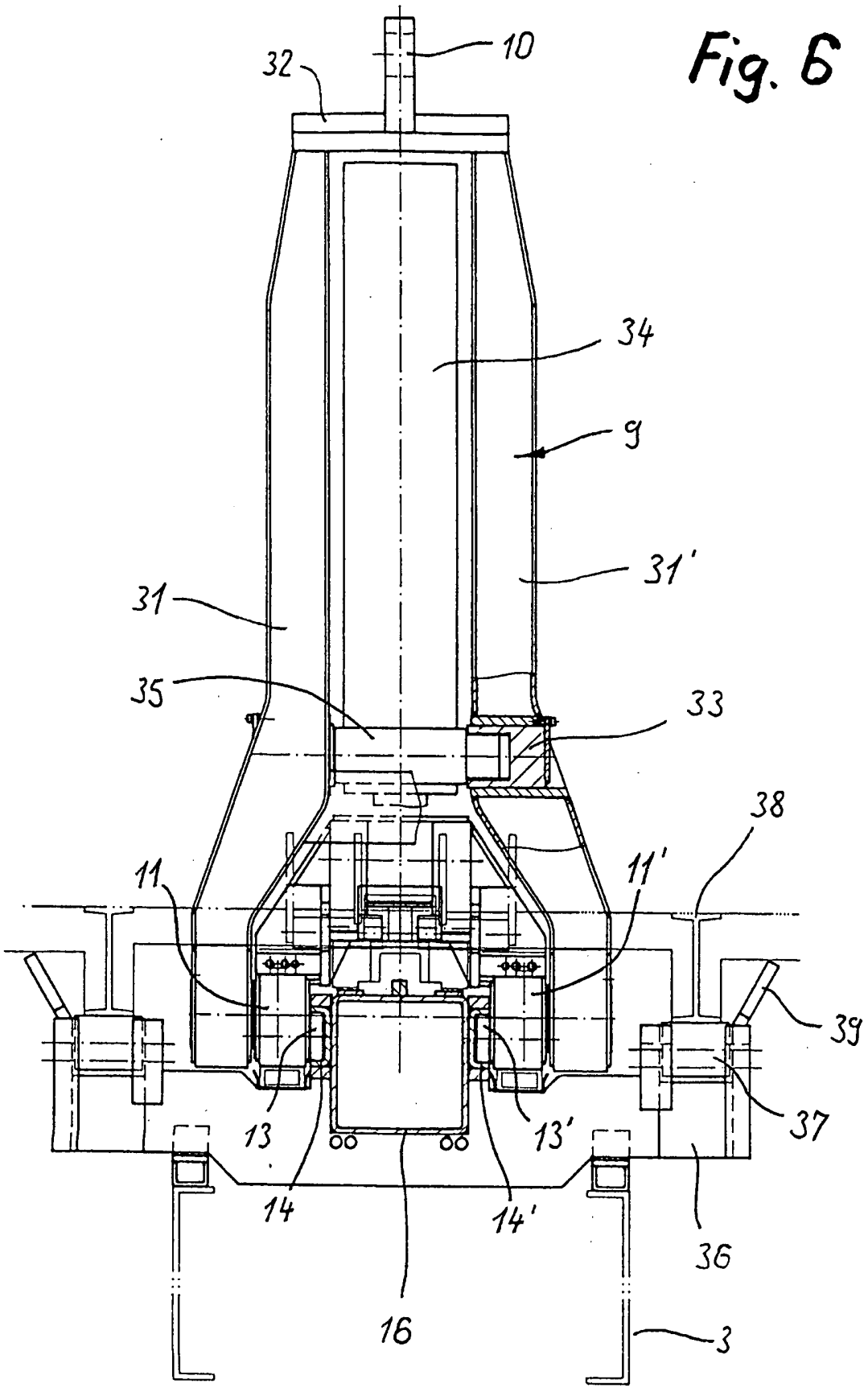
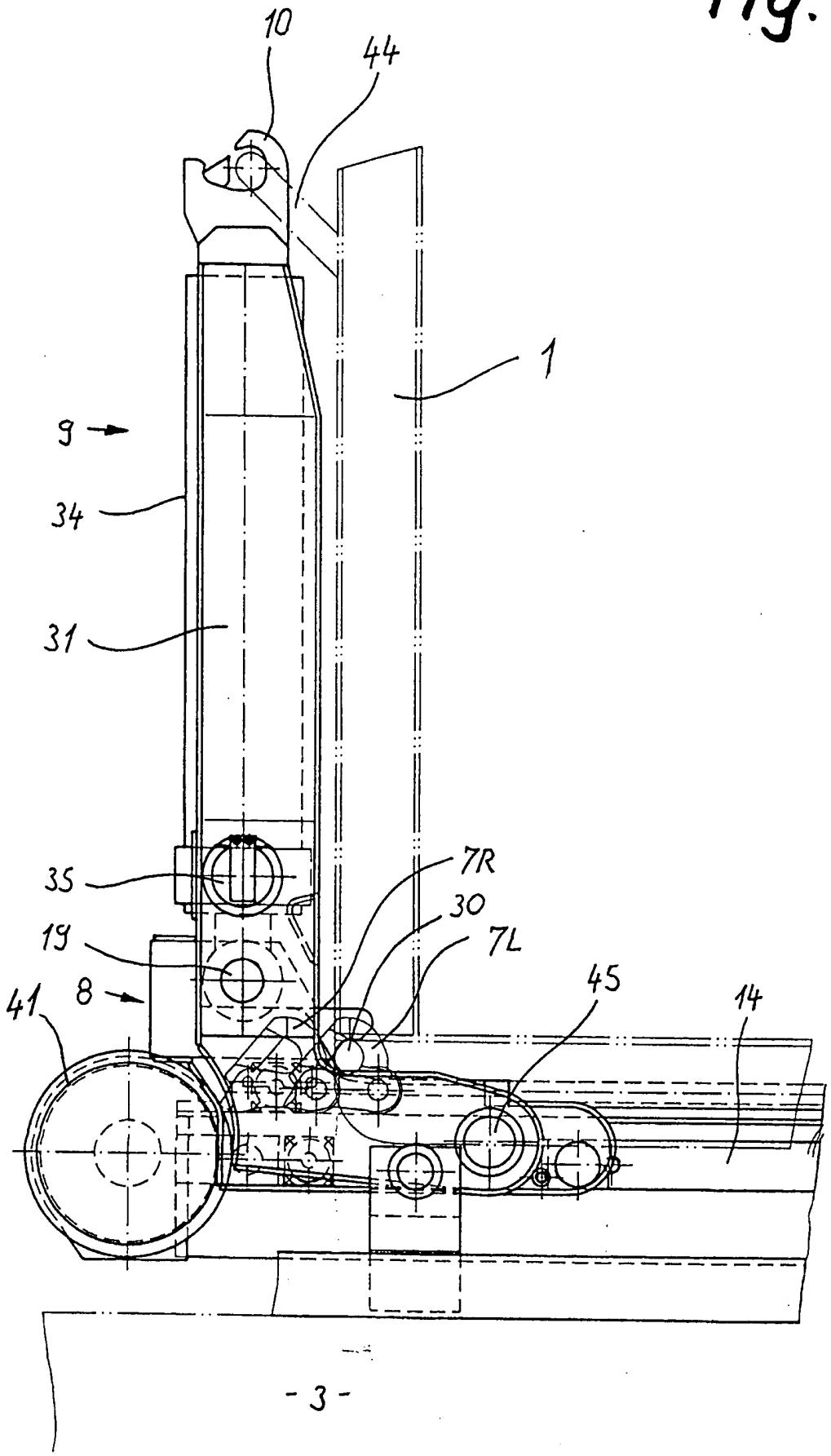


Fig. 7



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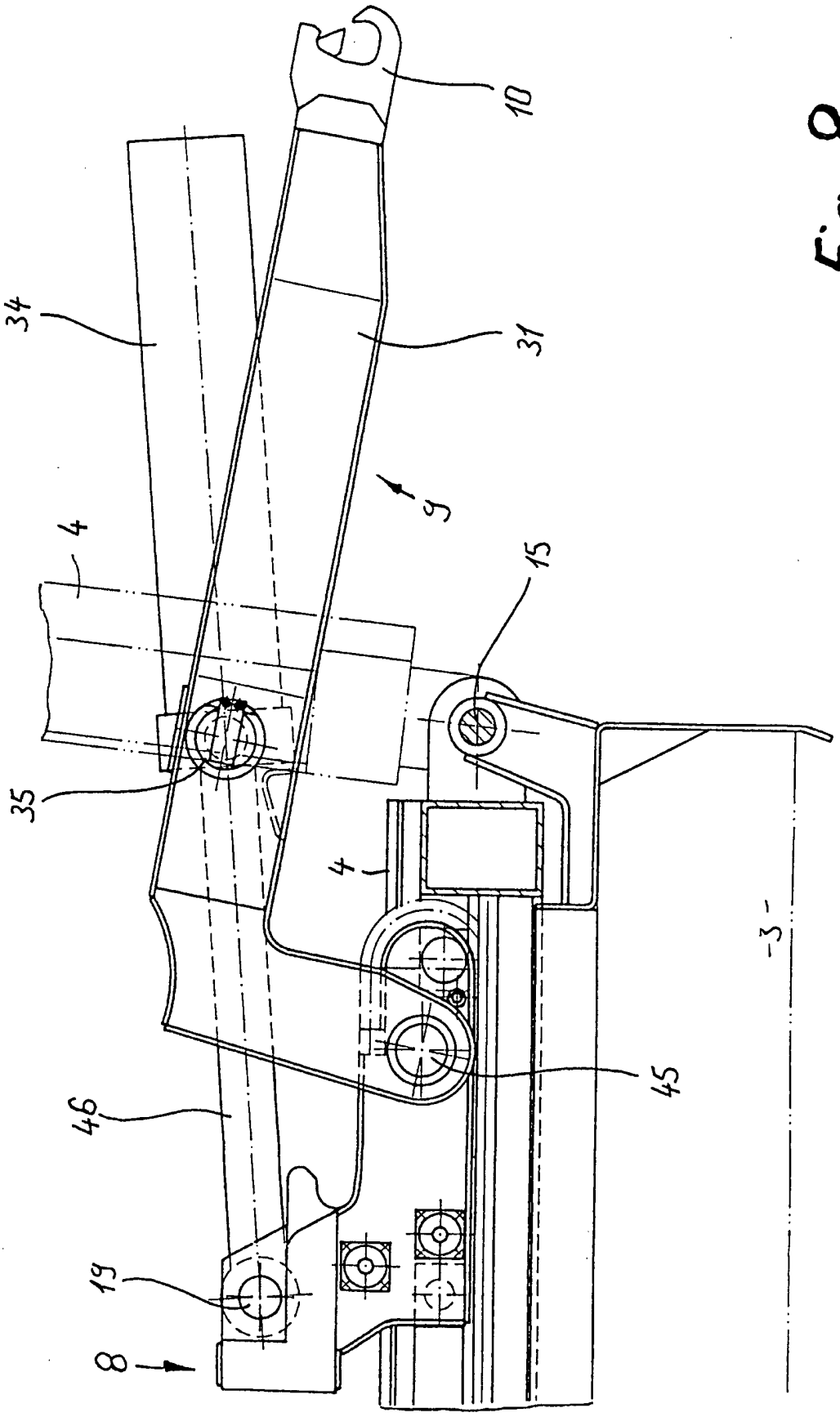

Fig. 8

Fig. 9

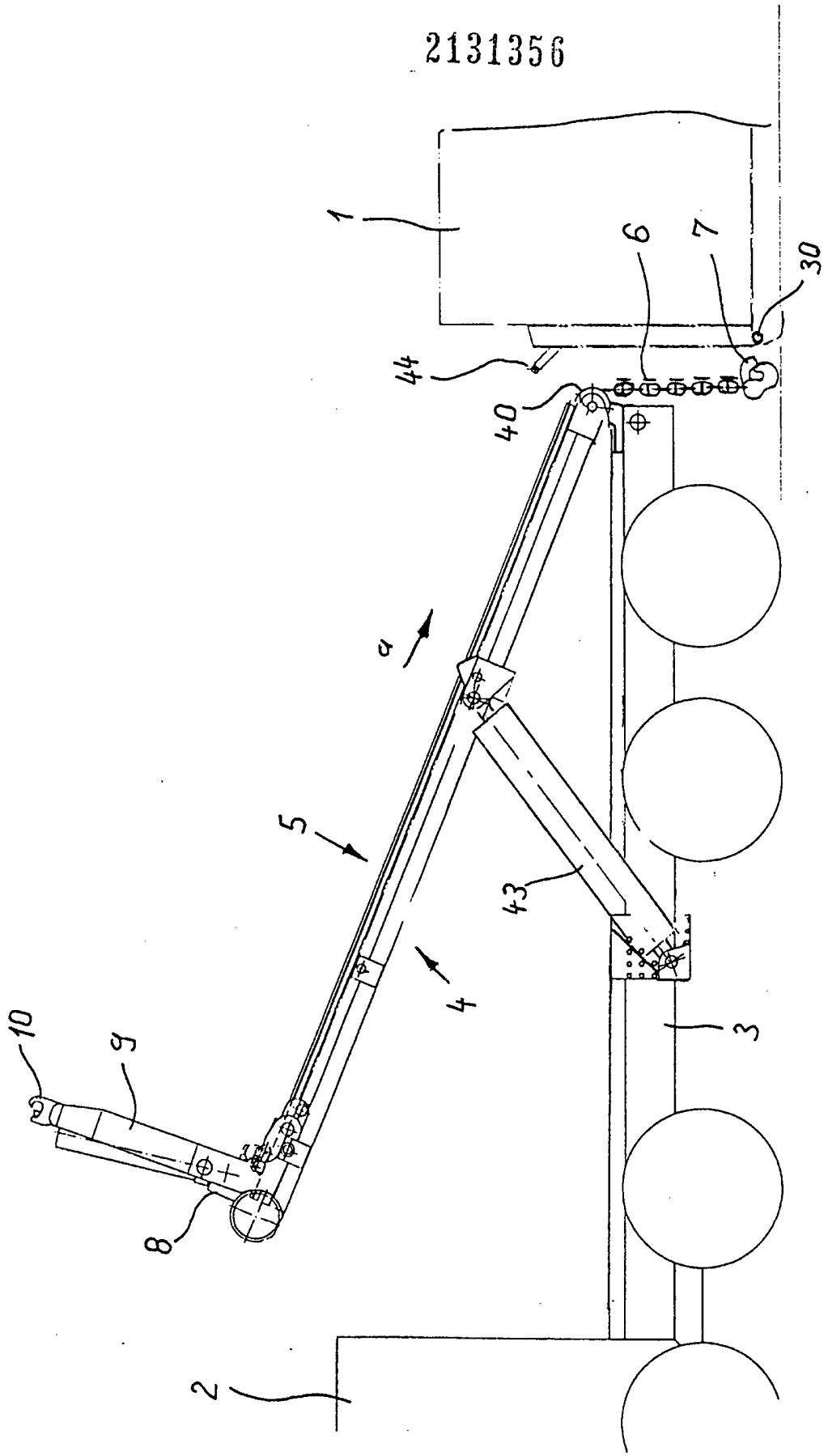

Fig. 10

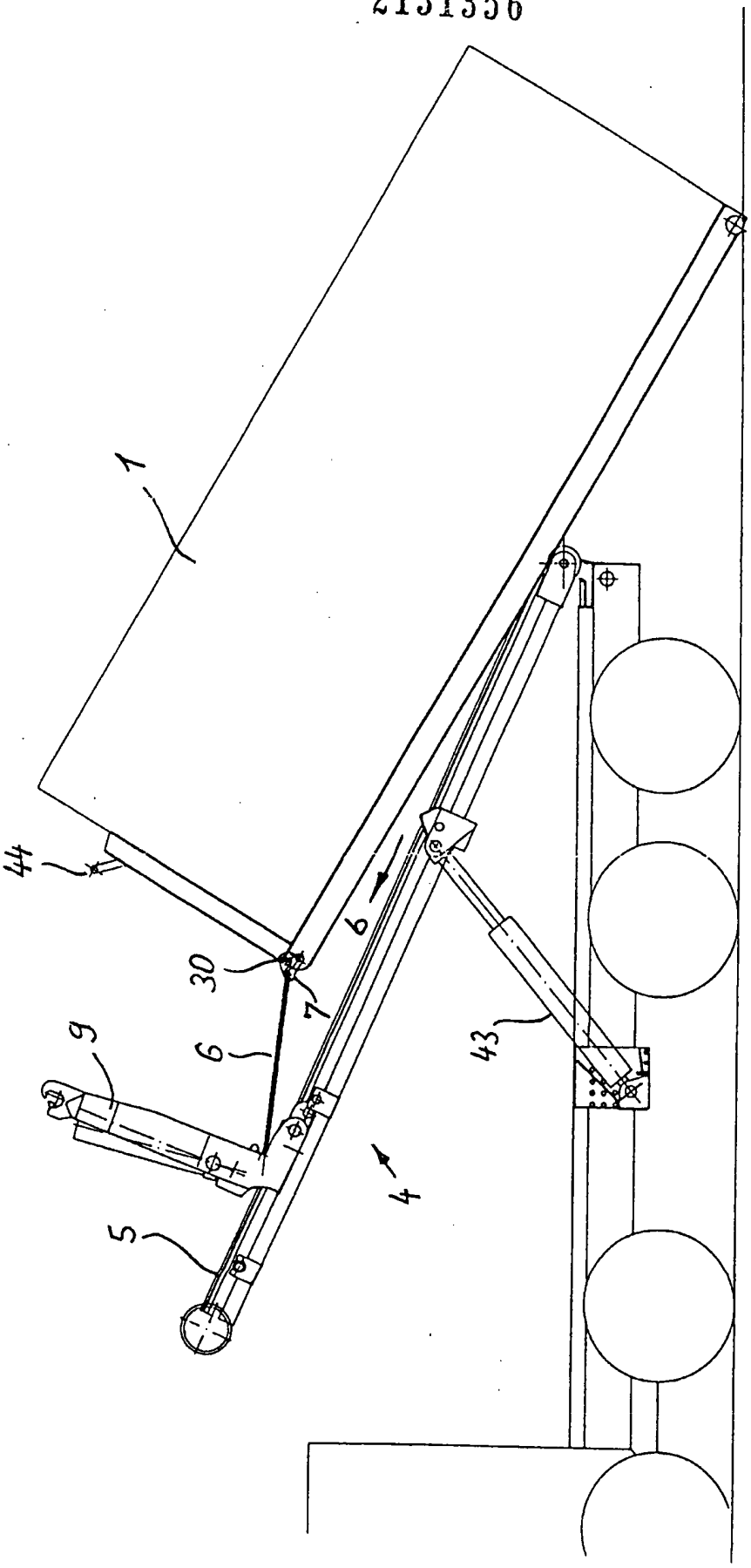

Fig. 11

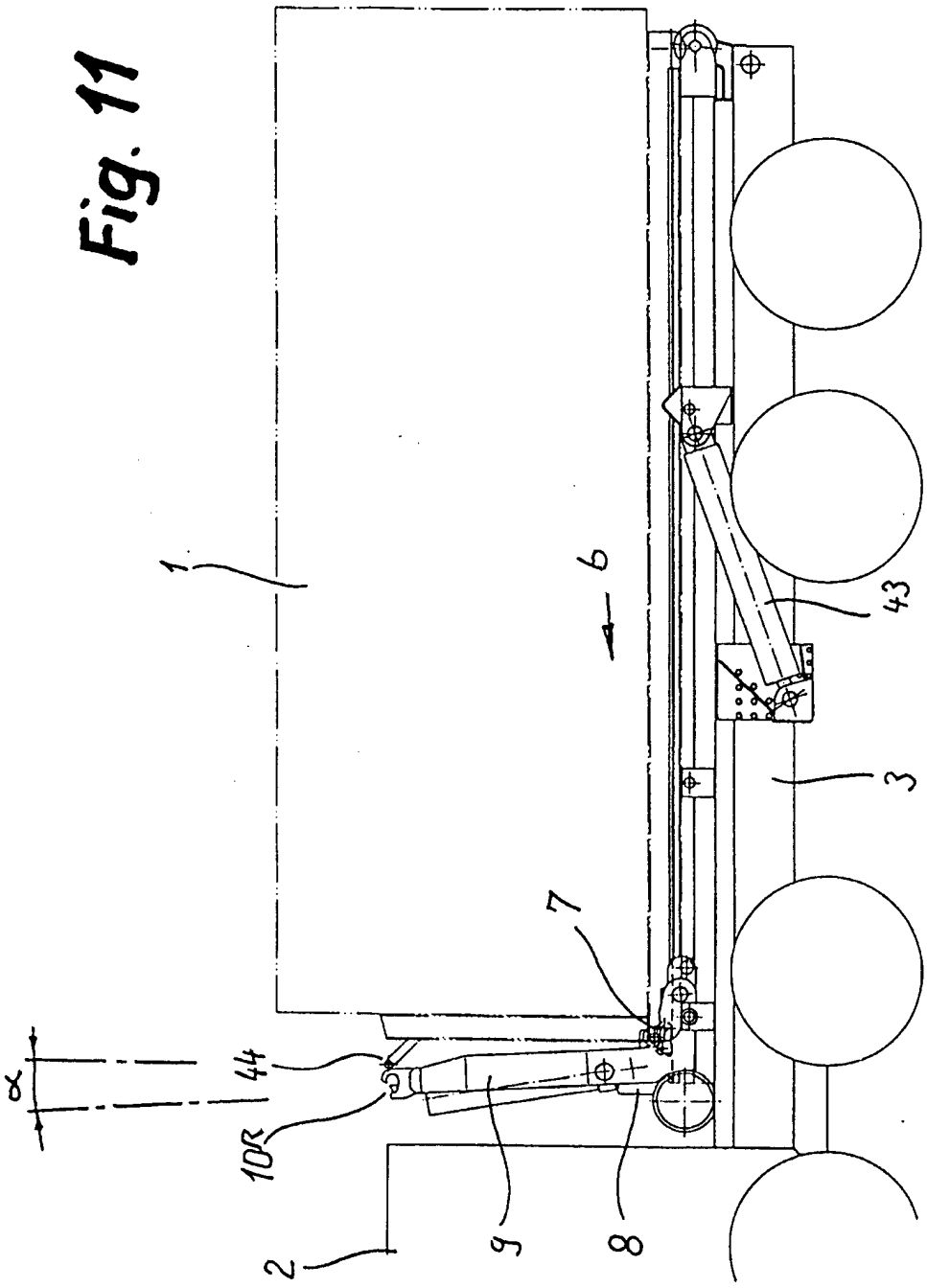

Fig. 12

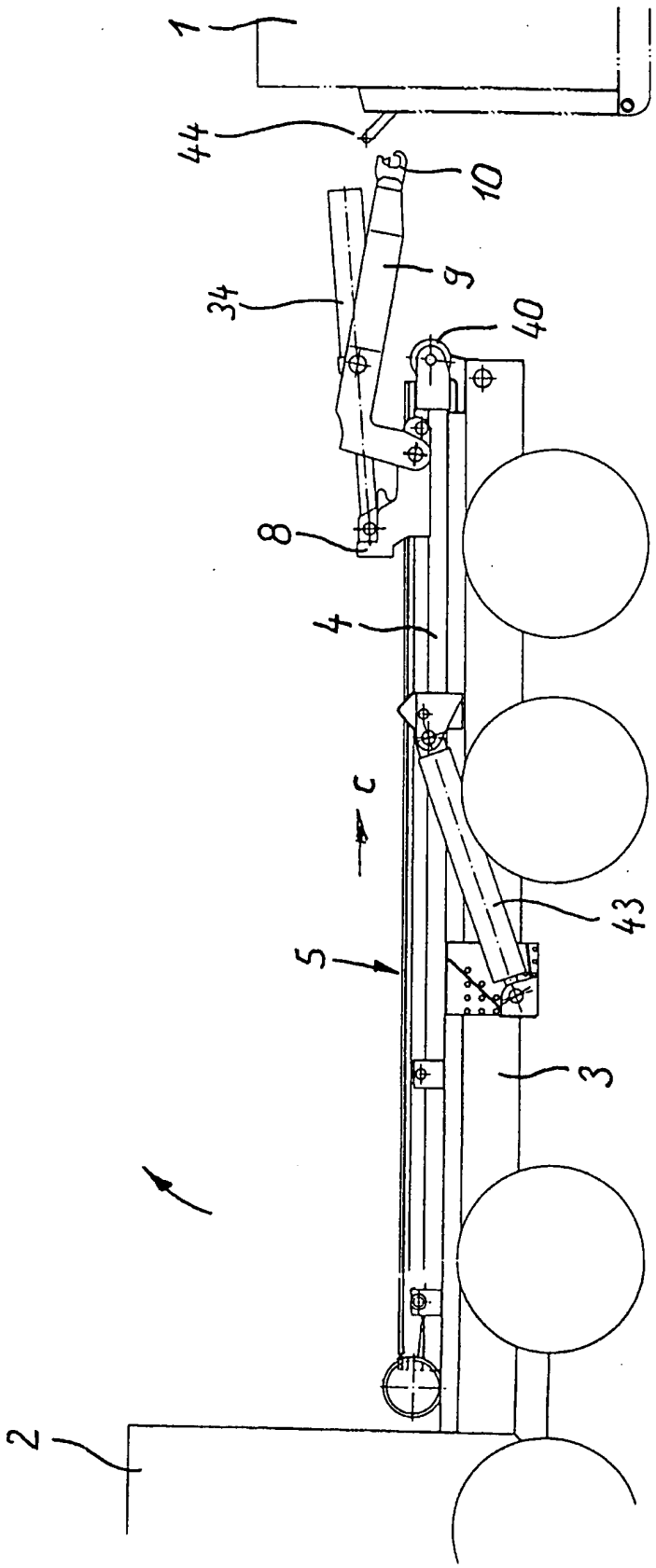

Fig. 13

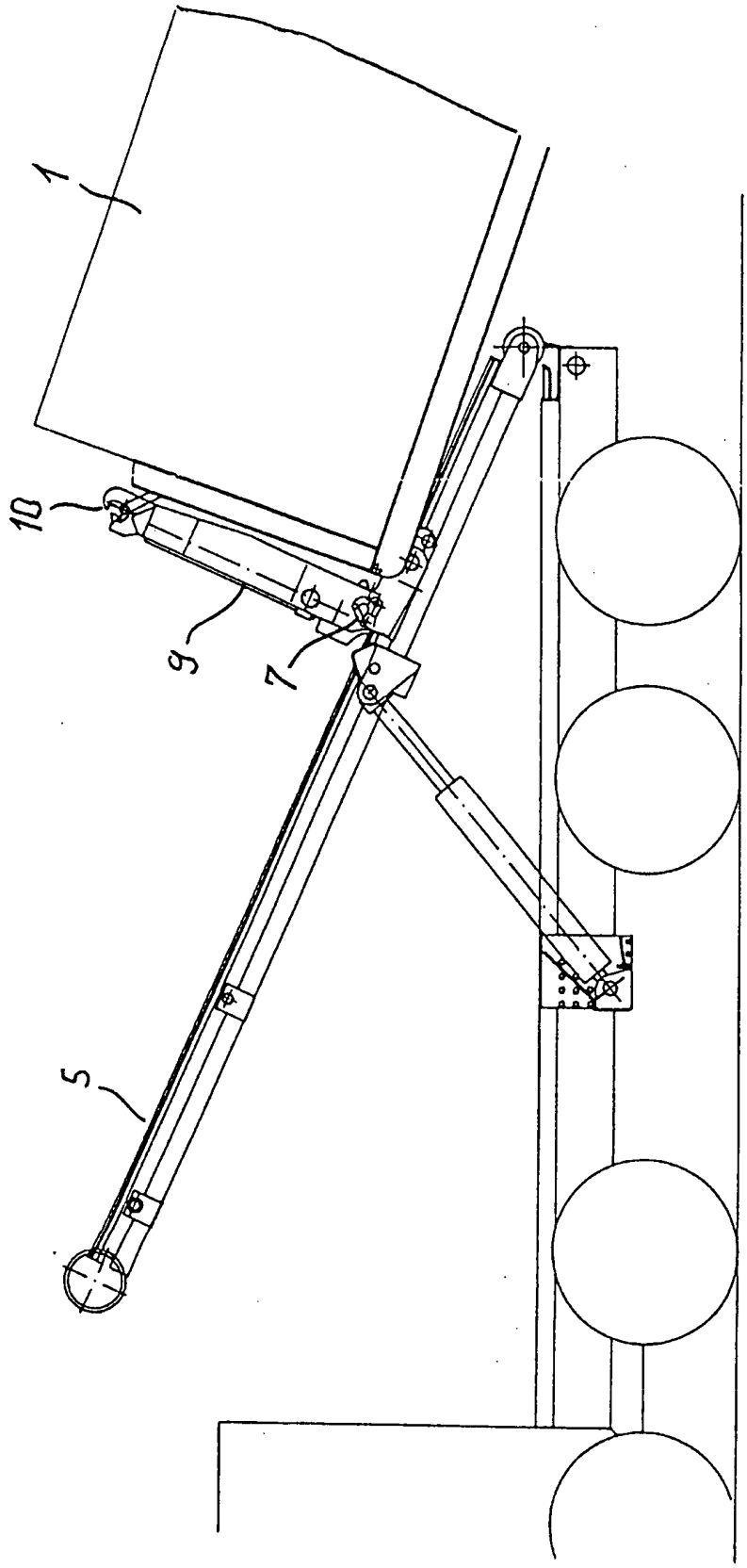

Fig. 14

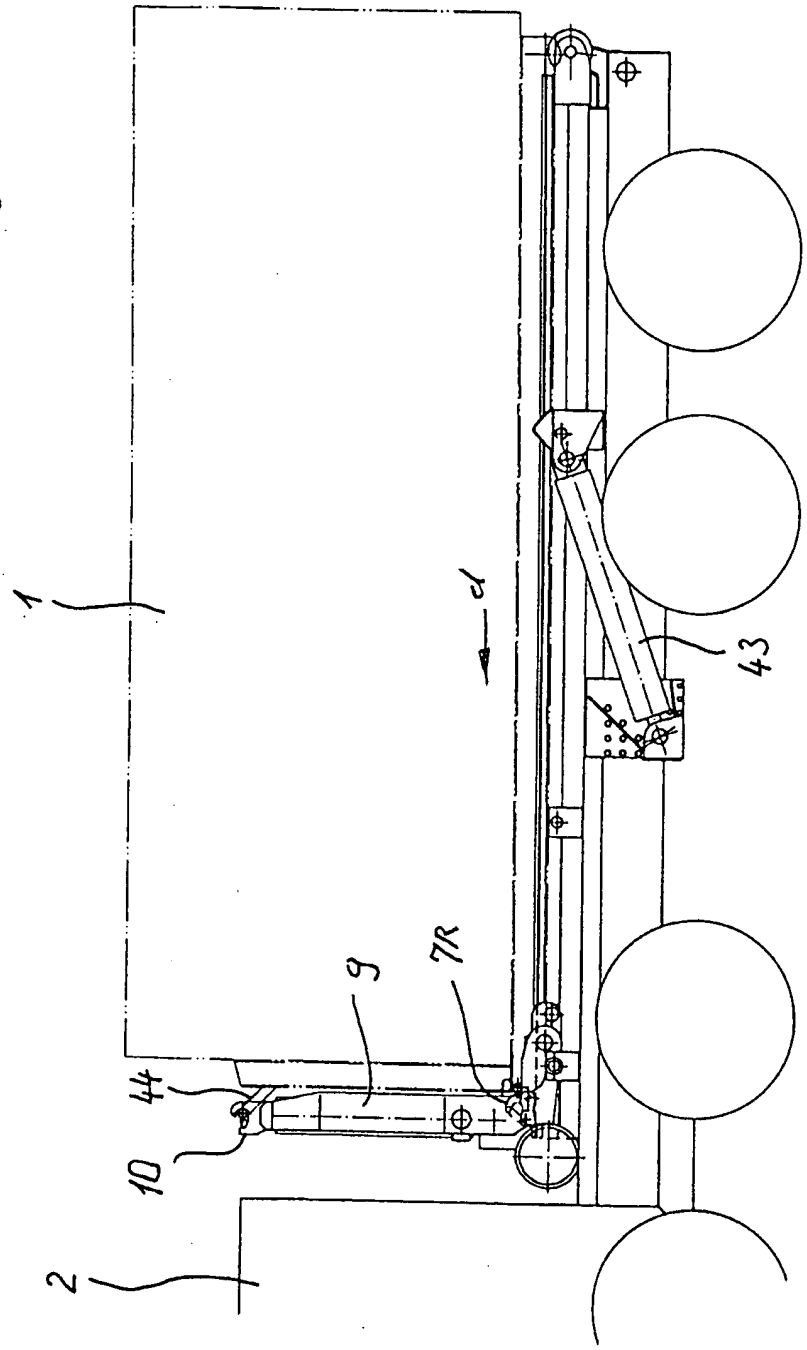

Fig. 15